FINAL

REMEDIAL DESIGN WORK PLAN FOR OPERABLE UNIT 4 SILOS 1 AND 2 PROJECT

AT THE UNITED STATES DEPARTMENT OF ENERGY FERNALD ENVIRONMENTAL MANAGEMENT PROJECT FERNALD, OHIO

40700-WP-0003

September 2001
Revision 2

Prepared Under DOE Contract No. DE-AC24-01OH20115
By Fluor Fernald, Inc.

FERNALD
Environmental Management Project

TABLE OF CONTENTS

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

ACA	Amended Consent Agreement
ARARs	*applicable or relevant and appropriate requirements*
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act, as amended
D&D	Decontamination and Demolition
DOE	U.S. Department of Energy
DOE-FEMP	U.S. Department of Energy-Fernald Environmental Management Project
ESD	Explanation of Significant Differences
FEMP	Fernald Environmental Management Project
FS/PP	Feasibility Study/Proposed Plan
NTS	Nevada Test Site
OEPA	Ohio Environmental Protection Agency
OU	Operable Unit
PCDF	Permitted Commercial Disposal Facility
RA	Remedial Action
RAWP	Remedial Action Work Plan
RD	Remedial Design
RDWP	Remedial Design Work Plan
RFP	Request for Proposal
ROD	Record of Decision
RCS	Radon Control System
TBC	To Be Considered
TTA	Transfer Tank Area
U.S. EPA	U.S. Environmental Protection Agency
VITPP	Vitrification Pilot Plant
WAC	Waste Acceptance Criteria

1.0 INTRODUCTION

1.1 Scope and Purpose of Operable Unit 4 Silos 1 and 2 Remedial Design Work Plan

This Remedial Design Work Plan (RDWP) documents the strategy for detailed planning and design of the selected remedy to treat Operable Unit 4 (OU4) Silos 1 and 2 material. This remedy includes retrieval and transfer of Silos 1 and 2 material from the Transfer Tank Area (TTA), followed by treatment using a chemical stabilization technology and packaging for shipment and disposal.

This RDWP specifies the scope and content of Remedial Design Deliverables for the Silos 1 and 2 Project, and establishes enforceable milestones for their submittal to the U.S. EPA for review and approval. One of these milestone the submittal of a Remedial Action Work Plan (RAWP), which will in turn establish subsequent enforceable milestones.

Remediation of the Silos 1 and 2 material will be implemented in accordance with the requirements identified in the "Record of Decision (ROD) for Remedial Actions at Operable Unit 4," December 1994, as modified by the "Record of Decision (ROD) Amendment for Operable Unit 4 Silos 1 and 2 Remedial Actions," July 2000. Only the selected remedy for the Silos 1 and 2 material, as specified in the original ROD and modified by the ROD Amendment for Silos 1 and 2, is addressed in this RDWP. Implementation of other portions of the OU4 remedy addressed in the original OU4 ROD, as modified by the "Final Explanation of Significant Differences (ESD) for Operable Unit 4 Silo 3 Remedial Action" are documented in other planning documents.

1.2 Background

The U.S. EPA approved and signed the original OU4 ROD on December 7, 1994. The selected remedy consisted of the following components:

- Removal of the contents of Silos 1, 2, and 3 and the decant sump tank sludge.
- Treatment of the Silos 1, 2, and 3 material and sludges removed from the silos and the decant sump tank by vitrification to meet the Nevada Test Site (NTS) waste acceptance criteria (WAC).
- Off-site shipment of the vitrified contents of Silos 1, 2, and 3 and the decant sump tank for disposal at the NTS.
- Demolition of Silos 1, 2, 3 and 4 and decontamination, to the extent practicable, of the concrete rubble, piping, and other generated construction debris.
- Removal of the earthen berms and excavation of the contaminated soils within the boundary of OU4, to achieve remediation levels. Placement of clean backfill to original grade following excavation.
- Demolition of the remediation and support facilities after use. Decontamination or recycling of debris before disposition.
- On-property interim storage of excavated contaminated soils and contaminated debris in a manner consistent with the approved *Work Plan for FEMP Removal Action No. 17 - Improved Storage of Soil and Debris* (DOE 1996)[1], pending final disposition of soil and debris in accordance with the RODs of OUs 5 and 3, respectively.
- Continued access controls and maintenance and monitoring of the stored waste inventories.
- Institutional controls of the OU4 area such as deed and land-use restrictions.

---

[1] This component of the selected remedy was documented in the original Operable Unit 4 Record of Decision in 1994. However, for purposes of this Remedial Design Work Plan, the reference has been updated to the most recent revision.

- Potential, additional treatment of stored OU4 soil and debris using OU5 and OU3 waste treatment systems.

- Pumping and treating, as required, of any contaminated perched groundwater encountered during remedial activities.

- Disposal of the OU4 FEMP contaminated debris and soils consistent with the RODs for OUs 3 and 5, respectively.

Although the selected remedy documented in the original OU4 ROD specifies that on-site disposal for the OU4 soil and debris was preferred, the final decision regarding the disposition of the OU4 debris and soils was placed in abeyance, until the OU3 and OU5 RODs were approved. This approach allowed DOE to take full advantage of planned waste management and treatment strategies developed by these OUs and enabled the integration of disposal decisions for OU4 contaminated soils and debris on a site-wide basis.

The original OU4 RDWP was approved by the U.S. EPA on June 15, 1995. As part of the strategy outlined in the RDWP, the DOE-FEMP conducted several pilot-scale treatability studies on-site and conducted several other treatability studies off-site in partnership with the academic community. Vitrification Pilot Plant (VITPP) Phases I and II Treatability Study Programs were integrated directly into the OU4 RD/RA program to collect quantitative performance data to support the application of the vitrification technology for the remediation of the silos materials.

Phase I VITPP testing activities began June 19, 1996, with initiation of the first of four campaigns. During the treatability study program, many technical and operational difficulties were encountered. Attempts to resolve technical and operational issues during VITPP operations resulted in documented schedule and cost increases.

5A

In September 1996, the DOE formally requested from U.S. EPA an extension of time for enforceable OU 4 RD/RA milestones. In October 1996, the U.S. EPA denied DOE's request. The U.S. EPA and DOE then initiated the formal dispute resolution process under the Amended Consent Agreement (ACA) and began reevaluating alternatives for treatment of Silos 1, 2, and 3 material

During the final stages of the last campaign of the VITPP Phase I Testing Program, the melter hardware failed (December 26, 1996).

On July 22, 1997, the DOE-FEMP and the U.S. EPA formally approved an, "Agreement Resolving Dispute Concerning Denial of Request for Extension of Time for Certain OU4 Milestones" [hereafter referred to as "the Settlement"]. The Settlement resolved disputes concerning the schedule and path forward for the remediation of the Silos 1, 2, and 3 materials. In the Settlement, U.S. EPA and DOE-FEMP agreed that DOE-FEMP would prepare an Explanation of Significant Differences (ESD) documenting the change in treatment technology for Silo 3 material, and supplement the original OU4 Feasibility Study/Proposed Plan (FS/PP) to evaluate vitrification and other alternatives for treatment of the Silos 1 and 2 material. DOE-FEMP would then amend the OU4 ROD based on the results of the revised FS/PP.

The U.S. EPA signed the Final ROD Amendment for Silos 1 and 2 Remedial Action on July 13, 2000. The ROD Amendment addresses the re-evaluation of the treatment component of the selected remedy for the remediation of the OU4 Silos 1 and 2 material at the FEMP Site in Fernald, Ohio. The remedial action identified in the ROD Amendment was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act, as amended (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations Part 300).

The decision was based on the information in the administrative record for OU4, which is maintained in accordance with CERCLA. The major documents prepared through the CERCLA process include the Remedial Investigation, the FS/PP, and the ROD for OU4, and the revised FS/PP and the ROD Amendment for the Silos 1 and 2 material. This decision also considered state and stakeholder input, including input received during the public hearing held in Fernald, Ohio and the public meeting held in Las Vegas, Nevada following the issuance of the revised FS/PP for the Silos 1 and 2 material. DOE considered all comments received during the public comment period on the revised FS/PP for the Silos 1 and 2 material in the preparation of the ROD Amendment.

The State of Ohio concurred with the remedy and the applicable or relevant and appropriate requirements (ARARs) put forth in the ROD Amendment for the remediation of the OU4 Silos 1 and 2 material.

As part of the Silos 1 and 2 remediation, the Silos 1 and 2 Accelerated Waste Retrieval (AWR) Project was initiated in February 1999 to retrieve the contents of Silos 1 and 2 and the Decant Sump Tank System and transfer it to a newly constructed, environmentally controlled TTA. The primary objective of this project it to provide safe, interim storage of the Silos 1 and 2 material pending remediation by the selected chemical stabilization technology. The project also includes the construction of a Radon Control System (RCS) to control the release of radon-222 to the environment during the retrieval and interim storage of Silos 1 and 2 material in the TTA. In addition, the RCS will have the capability to control the release of radon-222 to the environment during the transfer, treatment, and interim storage of the Silos 1 and 2 material within the remediation facility.

The July 1997 Settlement modified Section XI.A of the ACA to require submittal of a RDWP, specifically for the Silos 1 and 2 Project, to the U.S. EPA for review and approval within 60 days of U.S. EPA signing the ROD Amendment. To meet that commitment, a

Remedial Design Work Plan for the Silos 1 and 2 Project was submitted to the U.S. EPA and the OEPA on September 6, 2000. The Silos 1 and 2 RDWP was approved by the U.S. EPA on September 27, 2000. The Silos 1 and 2 RDWP was based upon an execution approach involving the award of a turnkey subcontract for the design, construction and operation of the necessary facilities for implementation of the Silos 1 and 2 remedy. Milestones were established for award of the subcontract, and for the subsequent submittal of a schedule for Remedial Design deliverables.

In November 2000, the DOE awarded Fluor Fernald, Inc. a cost-plus-incentive-fee completion contract to complete remediation, restoration, and closure of the FEMP. This Closure Contract allows Fluor Fernald to directly execute certain activities previously required to be subcontracted. In order to expedite implementation of Silos 1 and 2 remediation, which is a critical-path activity in completing remediation of the FEMP, a decision was made to change the execution approach for the Silos 1 and 2 Project to one where Fluor Fernald, Inc. and its teaming partners would directly prepare the necessary design, and conduct the construction and operations activities. This revised RDWP identifies and outlines the strategy for implementing the remedial design activities under this approach. In addition, this revised RDWP defines the remedial design deliverables to be submitted by DOE to U.S. EPA and specifies the associated enforceable milestones.

(end of page)

2.0 REMEDIAL DESIGN SCOPE AND STRATEGY

2.1 Scope of the Silos 1 and 2 Remedial Action

The remedy for the Silos 1 and 2 material, identified in the ROD Amendment and approved by U.S. EPA with OEPA concurrence, consists of:

- Complete removal of the contents of Silos 1 and 2 and the Decant Sump Tank System sludge from the TTA, followed by treatment using chemical stabilization to stabilize characteristic metals to meet Resource Conservation Recovery Act (RCRA), as amended, toxicity characteristic limits and attain the NTS WAC.

- Gross decontamination, demolition, size reduction, and packaging of concrete from Silos 1 and 2 structures followed by shipment for off-site disposal at the NTS or an appropriately permitted commercial disposal facility (PCDF).

- Disposal of contaminated soil and debris, excluding concrete from Silos 1 and 2 structures, in accordance with the FEMP On-site Disposal Facility WAC or at an appropriate off-site disposal facility, such as the NTS or a PCDF.

In addition, the selected remedy includes the following components, which remain as defined in the original OU4 ROD:

- Off-site shipment and disposal of the chemically stabilized waste at the NTS.

- Decontamination and demolition (D&D) of all structures and remediation facilities.

- Removal of the earthen berms and excavation of the contaminated soils within the OU4 boundary, to achieve remediation levels in the OU5 ROD.

- Appropriate treatment and disposal of all secondary wastes at either the NTS or an appropriate PCDF.

- Collection of perched water encountered during remedial activities for treatment at OU5 water treatment facilities.

- Continued access controls and maintenance and monitoring of the stored waste inventories.
- Institutional controls of the OU4 area such as deed and land-use restrictions.

2.2 Silos 1 and 2 Remediation Execution Strategy

The Silos 1 and 2 Project will be implemented using an execution approach whereby Fluor Fernald, Inc. and its teaming partners would directly execute the necessary design, construction, and operations activities. The following Remedial Design activities will be executed under this approach:

- Preparation of Project Documentation;
- Design of the facilities, equipment and systems required to implement the Silos 1 and 2 remedy;
- Container development, design, testing, and, if required, certification;
- Preparation of Remedial Design deliverables;
- Preparation of Safety Basis Documentation;
- Long Lead Procurement; and
- Preparation, issuance and award of the necessary bid packages to provide the necessary construction labor and materials.

(end of section)

3.0 SILOS 1 AND 2 REMEDIAL DESIGN IMPLEMENTATION

3.1 Remedial Design Process

The Silos 1 and 2 Project is separated into six general work phases:

Remedial Design Phase:	Design and Documentation Phase
	Construction Phase
Remedial Action Phase:	Start-up Phase
	Operation Phase
	Facility Shutdown and Demolition Phase
	Demobilization Phase

The design of the treatment facility will be conducted during the design and documentation phase. This phase will include the calculations, engineering, and design activities necessary to develop process and support facilities to (1) retrieve and transfer the Silos 1 and 2 material from the TTA, (2) treat and package the Silos 1 and 2 material for transportation and disposal, and (3) provide proper disposition of all secondary waste, including wastewater and contaminated equipment and debris from project dismantlement activities. All remedial design activities will be implemented in accordance with the OU4 ROD as modified by the ROD Amendment.

3.2 Remedial Design Submittals

Principal elements of the preliminary design submittals will be compiled into a RD Package for U.S. EPA and OEPA review and approval. The RD Package will define the design of the remediation facility to successfully stabilize the Silos 1 and 2 material. The RD

Package will also describe the environmental controls that will be implemented to ensure protection of human health and the environment. The RD Package will contain the following information:

- Process Description - Provides an overview of each of the systems that comprise the Silos 1 and 2 Remediation Facility. The functions of these systems are to retrieve, transfer, treat, package, transport, and dispose Silos 1 and 2 material.

- Process Control Plan – Provides a general overview of the instrumentation and control equipment, setpoints/alarm limits, and responses to key parameters to be used to maintain operation of the Silos 1 and 2 facility within the specified operating parameters. The process controls will be designed to maintain compliance with environmental, worker protection and safety limits, assure that the treated Silos 1 and 2 material meets WAC, and to provide efficient operation of the facility

- Design Documentation - The following elements of the Preliminary Design Package will be included in the RD Package:
  - Silos 1 and 2 chemical stabilization technology description
  - TTA and RCS interface description with remediation facilities
  - Process Flow Diagrams and Piping and Instrumentation Diagrams
  - Heating, Ventilation and Air Conditioning flow diagrams
  - Heat and material balance
  - General Arrangement drawings
  - Site Plans
  - Excavation, Drainage, Erosion Control, and Stormwater management drawings/details

- Environmental Control Plan, which will include:
  - Air Emissions Control: estimates of air emissions from all point sources; dispersion modeling results to predict the off-site impact of maximum potential radionuclide particulate and radon emissions; anticipated pollutant controls to be used; and any plans for stack or ambient air monitoring for radon releases and other air contaminants.
  - Dust Control: description of the methods and materials used to suppress and minimize the creation and dispersion of dust, in accordance with RM-0047, FEMP Fugitive Dust Control Requirements.

- Wastewater Control: description of the design features and methods to be used to eliminate, minimize, or recycle, or treat and discharge the wastewater produced during operations.
- Stormwater Control: description of the methods, materials, existing site features, and proposed modifications needed to segregate, capture, and control stormwater.
- Erosion Control: description of the methods and materials used to prevent erosion of soil either by wind or surface water in the process or project work area to reduce sediment loading in the stormwater.
- Waste Management: description of the design approach and methods to manage secondary waste and debris, including excess soil, generated during construction and operation.

• ARAR Compliance Matrix: description of the strategy for ensuring compliance with each ARAR or TBC. A cross-reference of each ARAR to the appropriate design document (the cross-reference will identify the relevant section within this document) detailing how the ARAR is satisfied.

• Description of Health and Safety Controls for construction activities, including a Contingency Plan identifying procedures responding to potential emergencies or off-normal events that could be anticipated during construction in the project area.

During the remedial design process, constructabilty reviews will be conducted to evaluate the optimum sequence of construction activities in order to mitigate schedule risks and make most effective use of available funding. One potential result of these reviews could be the identification of "advance construction" packages to be initiated prior to completion of the entire final design. If such activities are identified, the appropriate remedial design documentation will be compiled into an early RD Package, to be submitted for U.S. EPA and OEPA review and approval prior to initiation of the advance construction activities.

3.3 Remedial Action Submittals

3.3.1 Remedial Action Work Plan

Following approval of the RD Package by the U.S. EPA and OEPA, a Remedial Action Work Plan (RAWP) will be prepared and submitted to the U.S. EPA and OEPA. This plan will identify the implementation strategy and establish enforceable milestones for the RA phase of the Silos 1 and 2 Project. Among these milestones will be milestones for the submittal of Remedial Action documentation.

3.3.2 Remedial Action Package

The RA Package will contain documentation related to the operations phase of the Silos 1 and 2 Project, and will be submitted for review and approval by U.S. EPA and OEPA before providing authorization to operate. The RA Package will include:

- Sampling and Analysis Plan;
- Health and Safety Plan for Remedial Action Operations;
- Operation and Maintenance Plan; and
- Gross Decontamination Plan.

3.3.3 Transportation and Disposal Plan

The Transportation and Disposal Plan will define the implementation of transportation and disposal operations to ensure the safe and successful storage, staging, and transportation of treated Silos 1 and 2 material from the FEMP to the NTS. The scope of the Plan will be to: 1) describe the logistics (e.g., container handling, transportation routes, etc.) associated with transportation of the treated Silos 1 and 2 material, 2) summarize the operational aspects and procedures for the safe transportation of the treated Silos 1 and 2

material to the NTS, and 3) demonstrate that the treated Silos 1 and 2 material will be disposed at the NTS in a safe and environmentally protective manner. The Transportation and Disposal plan will be submitted to U.S. EPA and OEPA for approval prior to initiating transportation and disposal operations.

(end of section)

4.0 SCHEDULE FOR THE SILOS 1 AND 2 REMEDIAL DESIGN

The following milestones are established for implementation of the Silos 1 and 2 remedial design:

TABLE 4-1
MILESTONES FOR THE SILOS 1 AND 2 REMEDIAL DESIGN

Milestone	Date
Submit Draft RD Package to U.S. EPA for review	December 20, 2002
Submit Draft RA Work Plan to U.S. EPA for review	June 30, 2004
Submit Draft RA Package to U.S. EPA for review	To be specified in RA Work Plan
Submit Draft Transportation and Disposal Plan to U.S. EPA for review	To be specified in RA Work Plan
Milestones for implementation of Silos 1 and 2 remedial action	To be specified in RA Work Plan

5.0 BIBLIOGRAPHY

Comprehensive Environmental Response, Compensation, and Liability Act. 1980. *U.S. Code*. Vol. 42, secs. 9601 - 9675.
[overview at http://www.epa.gov/superfund/whatissf/cercla.htm]

Fernald Environmental Management Project (FEMP). 1993a. *Remedial Investigation Report for Operable Unit 4*. ([2]AR Index Numbers Vol. I-III: U-006-304.15 – 17)

— 1993b. *Feasibility Study/Proposed Plan – Final Environmental Impact Statement (FS/PP-EIS) for Remedial Actions at Operable Unit 4*. DOE/EIS–0195D. ([2]AR Index No. Vol. I-IV: U-006-404.8 – 11; also includes *FS* Vol. I-IV U-006-404.13 - 16; *PP* U-006-405.3; and *RI* Vol. I-III U-006-304.15 - 17)

— 1994a. *Feasibility Study for Operable Unit 4*. ([2]AR Index Numbers Vol. I-IV: No. U-006-404.13 –16)

— 1994b. *Proposed Plan for Remedial Actions at Operable Unit 4*. ([2]AR Index No. U-006-405.3)

— 1996c. *Operable Unit 3 Record of Decision for Final Remediation Action*. ([2]AR Index No. U-005-501.9)

— 1996d. *Operable Unit 5 Record of Decision*. ([2]AR Index No. U-007-501.4)

---

[2] Documentation of Remedial Investigation/Feasibility Study activities for each operable unit is made available for public review. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Administrative Records for the FEMP site are located at the Public Environmental Information Center (PEIC), 10995 Hamilton-Cleves Highway Harrison, Ohio 45030; 513-648-7480.

— 1998a. *Final Explanation of Significant Differences for Operable Unit 4 Silo 3 Remedial Action at the Fernald Environmental Management Project.* 40400-RP-0004. ([2]AR Index No. U-006-503.11)

— 1999a. *Revised Feasibility Study Report for Silos 1 and 2.* ([2]AR Index Numbers Vol. I-IV: U-006-404.18 – 21)

— 1999b. *Revised Proposed Plan for Remedial Actions at Operable Unit 4.* ([2]AR Index No. U-006-405.4)

U.S. Department of Energy (DOE). 1996. *Work Plan for FEMP Removal Action No. 17 - Improved Storage of Soil and Debris.* ([2]AR Index No. R-028-204.11 for Work Plan; Addenda R-028-204.13 & 14)

U.S. Environmental Protection Agency (EPA). 1991. *Consent Agreement as Amended under CERCLA Sections 120 and 106(a) in Matter of: U.S. Department of Energy Feed Materials Production Center, Fernald, Ohio.* Chicago, IL: Office of Public Affairs, Region 5. ([2]AR Index No. G-000-710.12)

— 1994. *Record of Decision for Operable Unit 4.* EPA ID OH6890008976; ROD ID EPA/ROD/R05-95/287. ([2]AR Index No. U-006-501.5)
[abstract at http://www.epa.gov/superfund/sites/rodsites/0504934.htm]

— 1997a. RE: OU4 Post-ROD Changes, letter from J.A. Saric (USEPA) to J.W. Reising (USDOE). ([2]AR Index No. U-006-409.17)

— 1997b. Agreement Resolving Dispute Concerning Denial of Request for Extension of Time for Certain Operable Unit 4 Milestones Chicago, IL: Office of Public Affairs, Region 5. Administrative Docket No. V-W-90-C-057. ([2]AR Index No. U-006-409.16)

— 2000a. Record of Decision Amendment for Operable Unit 4 Silos 1 and 2 Remedial Actions. ([2]AR Index No. U-006-502.3)

— 2000b. Remedial Design Work Plan for Operable Unit 4 Silos 1 and 2 Project. ([2]PROD Index No. 4-201.16)